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PROVISIONAL SPECIFICATION

Invention Title: **Asphalt surface treatment**

The invention is described in the following statement:

Asphalt surface treatment

Field of the invention

The present invention relates to a composition and a method for coating an asphalt surface.

Background of the invention

Asphalt wearing courses are extensively used in the construction of roads, carparks, driveways, schoolyards, hardstand areas and sporting surfaces. Asphalt wearing courses generally comprise mixtures of asphaltic binders, graded aggregates, sands, fillers and additives. Asphalt wearing courses include hot mixed asphalts, chip seal wearing courses and any other wearing surfaces having a layer of aggregate mixed with an asphaltic or bituminous binder.. They are prone to ageing from the effects of weathering, particularly from ultra violet attack and oxidation. Weathering of an asphalt wearing course causes a loss of ductility and brittleness of the asphaltic binder leading to ravelling, the loss of sand, binder and aggregate particles on the surface matrix of the wearing course. Loss of ductility and brittleness of the asphaltic binder also lead to surface cracking, moisture ingress to the underlying pavement layers and risks unnecessary breakdown of the structural integrity of the pavement.

As asphalt wearing courses weather, the asphalt binder degrades and tends to recede, leaving a surface texture in which the aggregate extends above the upper surface of the asphaltic binder. The asphaltic binder also contains voids and cracks due to degradation and weathering of the asphaltic binder. such surfaces. Throughout this specification, such surfaces will be referred to as "weathered asphalt surfaces."Current methods of improving a weathered asphaltic wearing course include:

(a) Preparing the pavement surface and resealing the wearing course with another layer of hot mixed asphalt.

(b) Surface treatment processes including asphaltic slurry seals, asphalt chip seals, asphalt sand seals and the like.

(c) Asphalt rejuvenation or enrichment processes that solvate and/or replace lost components of the asphaltic binder.

All of the above methods provide shortcomings either as economic or environmental solutions and are prone to the same weathering and replacement cycle as the surfaces they are covering.

Prior art examples of asphalt surface treatments include United States patent no. 4,851,456 to Dean, which describes a paste-like topcoat for surfaces. The topcoat composition comprises dry mix materials and liquid mix materials. The dry mix materials comprise sand, cement and a resinous binder. The resinous binder is preferably a cellulosic binder. The liquid mix materials comprise water, vinyl acrylates and/or methacrylate, and a solvent for at least one of the vinyl acrylates and resin binders. This composition is particularly useful as a topcoat for asphalt.

United States patent no. 5,578,663 describes a pavement rejuvenating and/or conditioning composition in which particular coal tar derivatives and other optional ingredients are supplemented with an elastomeric constituent. The elastomer may be incorporated as a latex, in solution or in the melt or as finely divided particles or fibrils. The coal tar derivatives are described as being a mixture of di-, tri- and tetra-cyclic aromatic compounds and their alkyl homologs containing lower alkyl groups together with a significant amount of phenolic and hydroxy derivates.

United States patent no. 6,113,978 relates to methods and compositions which comprise applying certain cationic fluorinated copolymer compositions to asphaltic material to protect the asphaltic material from damage from water, oil and weather. This patent teaches that using cross-linked resins or physical mixtures with a polymeric film former that form coatings which seal the surface of the substrate is undesirable as they give the substrate an aesthetically undesirable shiny and unnatural appearance, and will normally make a surface more slippery and prevent water drainage. In the invention described in this patent, it was found that asphaltic materials can be provided with increased resistance to damage from water, oil and weather while remaining porous and retaining a natural appearance.

The method of this earlier patent involves treating the asphaltic material with a composition comprising a dilute aqueous solution or a self-dispersed emulsion or dispersion of certain cationic, fluorinated copolymers, optionally in the presence of an effective amount of a penetration assistant. The penetration assistant is described as being any surface active organic substance that enhances the ability of an aqueous solution or self-dispersed emulsion or dispersion of the copolymer to penetrate and set out an asphaltic substrate. Examples include non-ionic, cationic or amphoteric surfactant. The patent states that a porous substrate largely retains its porosity after the inventive treatment, so air and moisture vapour can still pass through.

Summary of the invention

In the first aspect, the present invention provides a method for treating a weathered asphalt surface comprising the steps of:

- providing a composition comprising a solution, emulsion or dispersion of a polymeric material and particulate material, wherein said composition is essentially free of bituminous components and is essentially free of cement; and
- applying the composition to the asphalt surface.

Preferably, the composition is applied to the asphalt surface by spraying. However, other methods of application of the composition, such as by mechanised squeegee or slurry machine, or indeed any other application method known to be suitable by the person of skill in the art also fall within the scope of the present invention.

The composition used in the first aspect of a present invention includes a solution, emulsion or dispersion of a polymeric material. Preferably, an aqueous polymeric emulsion is used.

The solution, emulsion or dispersion of a polymeric material suitably includes one or more polymeric materials that form a film upon setting. In this fashion, the polymeric material will seal any minor cracking in the asphalt surface. The polymeric material can

also protect the weathered asphalt binder to prevent further weathering and moisture ingress to the underlying base course and thereby prevent structural damage, which is expensive to repair.

The polymeric material used in the method of the present invention is preferably an aqueous emulsion containing an acrylate or an aqueous emulsion of a urethane. Acrylic/urethane copolymer dispersions may also be used in the present invention. Other polymeric systems that are film-forming may also be used.

The polymeric formulation may also contain siloxane compounds, such as poly-dimethyl siloxane, to facilitate control of the temperature–dependent properties of the resulting polymer film. Other polymeric components, such as epoxy resins, may also be added.

The solution, emulsion or dispersion of polymeric material may further contain one or more curing agents. The selection of particular curing agent will depend upon the polymeric components used. For example, a polyamine may be used as a curing agent in urethane-based compositions.

The composition applied to the asphalt surface also includes particulate material. The particulate material may be selected from sand, mineral aggregates, rubber particles, or a mixture of two or more thereof. Rubber particles are preferred. Most suitably, the rubber particles are graded, recycled crumb rubber, such as those rubber particles available from companies involved in the recycling of vehicular tyres. The rubber particles may be treated to improve bonding between the rubber particles and the polymer. An example of a suitable process for treating the rubber particles is described in International patent publication no WO 00/53638, the entire contents of which are incorporated herein by cross reference.

The particulate material is used to provide thermal insulation to the asphalt surface following application of the composition. The particulate material also acts as a UV resistant, durable filler. Where rubber particles are used, the rubber particles have the added benefit of being flexible and resilient, which assists in preventing the particles

from breaking when the asphalt surface is traversed by heavy objects, such as automobiles.

It is envisaged that the composition applied to the asphalt surface in accordance with the first aspect of the present invention may vary, depending upon whether the asphalt surface carries vehicular traffic or not. On a road that carries vehicular traffic, the aggregate particles in the asphalt surface wear quickly wherein the surface texture of the asphalt surface is "polished" or "smooth". On a lightly trafficked road or a non-trafficked pavement like a schoolyard or sports court, the aggregate does not wear as fast. Rather, the asphalt surface deteriorates due to the asphalt binder degrading and wearing away. However, the aggregate shows very little sign of wear because it has not been subjected to heavy traffic flows.

For use on weathered asphalt surfaces that carry vehicular traffic, it is preferred that the composition is applied to the asphalt surface in a fashion such that any protruding aggregate in the asphalt surface is largely not covered with the polymer. If protruding aggregate is covered by polymer, the polymer will wear off, for example in the tyre tracks formed by the passage of automobiles along the surface, and look unsightly. In this embodiment of the method of the present invention, the composition does not cover the aggregate on the asphalt surface, but rather fills the voids or interstices between the aggregate particles and thereby protects the asphalt binder from further degradation.

In order to minimise or avoid the amount of polymer that coats the surface aggregate on the weathered asphalt surface that carries vehicular traffic, a low viscosity composition may be used. Alternatively, a cationic emulsion of polymeric material could be used as that will be likely to be repelled by the positive charge of the surface aggregate. As a further alternative, it may be possible to mechanically remove the composition from the surface aggregate prior to setting and film formation. This may be achieved, for example, by running a scraper blade or rotating brush across the surface aggregate before the polymer has set.

In applications where the method of the first aspect of the invention is to be applied to a weathered asphalt surface that carries vehicular traffic, it is preferred that rubber particles having a maximum size of less than 500 microns are mixed into the

composition to be applied to the asphalt surface. It is also preferred that the application rate of the composition to the asphalt surface will result in a thickness of between 100 and 200 micrometres being applied to the asphalt surface.

For more lightly trafficked weathered asphalt surfaces, where wearing of the polymeric material is not such an issue, the composition may be applied to the weathered asphalt surface such that it does cover the protruding surface aggregate. Therefore, in such applications, the composition may be of higher viscosity. The particulate material may also be of larger particle size. For example, where rubber particles are used, the rubber particles may have a maximum particle size of up to 2mm. As the preferred composition for application to lightly trafficked asphalt surfaces is also of high viscosity, a thicker layer of composition can be applied to the surface. This, combined with the preferred larger size of rubber particles, can provide a flexible wearing course on the surface of the asphalt surface. However, it will also be appreciated that the composition may be applied to lightly trafficked weathered asphalt surfaces such that any protruding aggregate in the asphalt surface is largely not covered with the polymer. This may be achieved as described above.

The method of the present invention may include the further steps of cleaning and preparing the asphalt surface prior to applying the composition thereto. The cleaning and preparation of the asphalt surface may include using a mechanised sweeper or vacuum to remove solid material from the asphalt surface. It may also involve repairing structural defects, such as potholes, prior to applying the composition.

The asphalt surface may also be processed with a further material to enhance adhesion of the polymeric coating to the asphalt surface. It will be appreciated that this step should be conducted prior to application of the composition to the asphalt surface.

In a second aspect, the present invention provides a composition for coating an asphalt surface comprising a solution, emulsion or dispersion of a polymeric material and particulate material, wherein said composition is essentially free of bituminous components and is essentially free of cement.

Preferred embodiments of the second aspect of the invention are as described with reference to the preferred embodiments of the first aspect of the present invention.

The present invention provides an economical, environmentally sound, resilient and aesthetically pleasing polymeric coating composition to prevent damage, rectify damage and arrest the aging process of asphalt surfaces. Preferred embodiments of the present invention utilise process scrap rubber, either as a durable filler or a surface bonded component within the polymeric coating. The composition forms a polymeric film upon setting. In areas that carry vehicular traffic, it is preferred that the polymeric film does not cover the protruding aggregate in the asphalt surface. In this embodiment, the protruding aggregate on the asphalt surface provides the desired wear properties for the trafficked surface whilst the polymeric mixture will be protecting the asphalt binder in the voids below the aggregate.

Preferred embodiments of the present invention utilise aqueous emulsions of polymeric materials. Suitable emulsions include commercially available products such as "Primal" sold by Rohm & Haas, "Viscopol" sold by Nuplex and "Acronal" sold by BASF.

The method and composition of the present invention provides for protection of weathered asphalt surfaces from degradation whilst utilising the inherent structural capacity of the existing asphalt wearing course. The present invention also avoids the use of seal coatings containing bitumen, coal tar or coal tar derivatives.

Those skilled in the art will appreciate that the invention described herein may be susceptible to variations and modifications other than those specifically described. It is to be understood that the present invention encompasses all such variations and modifications that fall within its spirit and scope.

Dated this 30th day of July 2003

Pollard Bros Pty Ltd

by its attorneys

Freehills Carter Smith Beadle